

ROUND 2

TOSS-UP

1) BIOLOGY *Short Answer* Two or more structures are said to be homologous if they are alike because of shared ancestry. Ovaries and testes share a developmental ancestry, meaning that the structures arose from the same tissue in what physical stage of human life?

ANSWER: EMBRYO

BONUS

1) BIOLOGY *Multiple Choice* All *Homo sapiens* are thought to share a common matrilineage. What genetic information has been used as key evidence for this shared matrilineage?

- W) Mitochondrial (read as: my-toh-KOHN-dree-ahl) DNA
- X) Nuclear DNA
- Y) Plasma membranes
- Z) Cytoplasmic tRNA

ANSWER: W) MITOCHONDRIAL DNA

TOSS-UP

2) MATH *Short Answer* Given a standard deck of 52 cards, what is the probability, expressed as a fraction in lowest terms, that the first card dealt is a heart?

ANSWER: $\frac{1}{4}$

BONUS

2) MATH *Short Answer* An ichthyologist wants to know the fish population of a pond. She catches 60 fish, tags them, and releases them. Two weeks later, she catches 50 fish and 7 of them have tags. Based on the data, what is the best estimate of the fish population of the pond? Round your answer to the nearest hundred.

ANSWER: 400

TOSS-UP

3) EARTH AND SPACE *Multiple Choice* In which of the following sedimentary environments would a dominantly organic sedimentary rock most likely be formed?

- W) Shallow marine
- X) Deep ocean
- Y) Wind-blown desert
- Z) Glacial outwash plain

ANSWER: W) SHALLOW MARINE

BONUS

3) EARTH AND SPACE *Multiple Choice* A high-energy river environment will most likely create which of the following deposits:

- W) Laminar silt beds
- X) Course-grained, angular cross bedding
- Y) Poorly sorted beds with no structure
- Z) Well rounded gravels

ANSWER: Z) WELL ROUNDED GRAVELS

TOSS-UP

4) MATH *Short Answer* What do we call a mathematical object that possesses both magnitude and direction?

ANSWER: VECTOR

BONUS

4) MATH *Multiple Choice* If \mathbf{b} is a negative vector of a given vector \mathbf{a} , then how do \mathbf{b} and \mathbf{a} compare?

- W) \mathbf{a} has a smaller magnitude than \mathbf{b}
- X) \mathbf{b} has a smaller magnitude than \mathbf{a}
- Y) \mathbf{b} has the same magnitude as \mathbf{a} , applied in the opposite direction
- Z) \mathbf{b} has a larger magnitude than \mathbf{a} , applied in the opposite direction

ANSWER: Y) \mathbf{B} HAS THE SAME MAGNITUDE AS \mathbf{A} , APPLIED IN THE OPPOSITE DIRECTION

TOSS-UP

5) CHEMISTRY *Short Answer* What letter designates the lowest energy subshell in any shell?

ANSWER: S

BONUS

5) CHEMISTRY *Short Answer* Identify the scientist who proposed the existence of energy levels for the electrons in an atom.

ANSWER: BOHR

TOSS-UP

6) PHYSICS *Short Answer* What causes low-pressure weather systems, such as tropical cyclones, to spin counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere?

ANSWER: CORIOLIS EFFECT (ACCEPT: CORIOLIS FORCE, ROTATION OF THE EARTH)

BONUS

6) PHYSICS *Short Answer* Billions of tiny ice crystals rub together to produce electron imbalances within storm clouds. What do we see when electrons arc to another cloud or to the ground?

ANSWER: LIGHTNING

TOSS-UP

7) EARTH AND SPACE *Multiple Choice* Which of the following minerals could be mined to create electrical wiring?

- W) Chalcopyrite (read as: kahl-koh-PY-ryt)
- X) Limestone
- Y) Galena (read as: gah-LEE-nah)
- Z) Gypsum

ANSWER: W) CHALCOPYRITE

BONUS

7) EARTH AND SPACE *Multiple Choice* Which of the following is the most abundant mineral group found in the Earth's crust?

- W) Carbonates
- X) Oxides
- Y) Sulfides
- Z) Silicates

ANSWER: Z) SILICATES

TOSS-UP

8) BIOLOGY *Short Answer* Most shelled organisms in the ocean make their shells out of calcium carbonate. What effect would increasing ocean acidity have on the shells of these organisms?

ANSWER: DISSOLVE/CORRODE THEIR SHELLS

BONUS

8) BIOLOGY *Short Answer* In the 1960s, a group of bacteria were discovered with magnetic crystals in a specialized organelle. It is believed that these bacteria used the crystals to help them align with what natural phenomenon?

ANSWER: THE EARTH'S MAGNETIC FIELD

TOSS-UP

9) CHEMISTRY *Multiple Choice* Which of the following is a common ion?

- W) Na²⁺
- X) Al³⁺
- Y) B²⁺
- Z) Kr²⁺

ANSWER: X) Al³⁺

BONUS

9) CHEMISTRY *Multiple Choice* Which of the following has an electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^6$ (read as: 1 s 2, 2 s 2, 2 p 6, 3 s 2, 3 p 6)?

- W) Sodium ion
- X) Chlorine
- Y) Neon
- Z) Calcium ion

ANSWER: Z) CALCIUM ION

TOSS-UP

10) BIOLOGY *Multiple Choice* In humans, where does the organ responsible for balance reside?

- W) Inner ear
- X) Middle ear
- Y) Outer ear
- Z) Hypothalamus

ANSWER: W) INNER EAR

BONUS

10) BIOLOGY *Short Answer* What is a common name for adipose tissue?

ANSWER: FAT

TOSS-UP

11) PHYSICS *Short Answer* What is the term that describes the separation of visible light into its component colors by a prism?

ANSWER: DISPERSION

BONUS

11) PHYSICS *Multiple Choice* Which of the following colors of light has the most energy?

- W) Yellow
- X) Red
- Y) Green
- Z) Violet

ANSWER: Z) VIOLET

TOSS-UP

12) EARTH AND SPACE *Multiple Choice* Which of the following is NOT considered a component of the modern theory of ice ages?

- W) The Earth wobbles on its axis
- X) The tilt of the Earth varies
- Y) Plate tectonics causes Earth's equator to change location
- Z) The Earth's orbit around the Sun varies

ANSWER: Y) PLATE TECTONICS CAUSE EARTH'S EQUATOR TO CHANGE LOCATION

BONUS

12) EARTH AND SPACE *Multiple Choice* Isostatic rebound following the end of the most recent ice age caused which of the following?

- W) Localized sea level rise
- X) Localized sea level drop
- Y) Mountain formation in the eastern part of the U.S.
- Z) Volcanism in Southern Mexico

ANSWER: X) LOCALIZED SEA LEVEL DROP

TOSS-UP

13) MATH *Short Answer* The point (1, 2) is reflected across the x axis. What are the coordinates of its image?

ANSWER: (1, -2)

BONUS

13) MATH *Short Answer* A viper had a length of 30 centimeters at 6 months of age and a length of 1.3 meters at 15 years old. Assuming that its growth was linear, which of the following is closest to its length in meters at 10 years old?

- W) 0.6
- X) 0.8
- Y) 1
- Z) 1.2

ANSWER: Y) 1

TOSS-UP

14) BIOLOGY *Multiple Choice* What characteristic has made angiosperms so successful during the last 140 million years?

- W) They are very tall, outcompeting other plants for sunlight
- X) They have flowers to attract pollinators
- Y) They are thorny to deter herbivores from consuming them
- Z) They are the only plants that can reproduce asexually

ANSWER: X) THEY HAVE FLOWERS TO ATTRACT POLLINATORS

BONUS

14) BIOLOGY *Multiple Choice* Fruits primarily function in order to entice animals to eat them. In what way does this benefit the fruiting plant?

- W) Animals disperse the seeds
- X) Animals pollinate while eating the fruits
- Y) Animals eat the fruit instead of other parts of the plant
- Z) There is no benefit to the plant

ANSWER: W) ANIMALS DISPERSE THE SEEDS

TOSS-UP

15) CHEMISTRY *Multiple Choice* Which of the following is true about the alpha particle?

- W) It is a hydrogen atom
- X) It was discovered by J.J. Thomson
- Y) It was used by Ernest Rutherford in experiments relating to the nucleus of the atom
- Z) It is purely electromagnetic radiation

ANSWER: Y) IT WAS USED BY ERNEST RUTHERFORD IN EXPERIMENTS RELATING TO THE NUCLEUS OF THE ATOM

BONUS

15) CHEMISTRY *Multiple Choice* What term best describes the type of reaction that converts uranium in the soil to radon?

- W) Acid-base
- X) Fusion
- Y) Electromagnetic radiation
- Z) Radioactive decay

ANSWER: Z) RADIOACTIVE DECAY

TOSS-UP

16) PHYSICS *Multiple Choice* A child is holding a string with a yo-yo dangling at the bottom of it. As the child yanks the string up, the tension in the string will:

- W) Decrease
- X) Increase
- Y) Stay the same
- Z) Become negative

ANSWER: X) INCREASE

BONUS

16) PHYSICS *Short Answer* When a girl wearing roller blades throws a ball in front of her, she slides backwards. Her movement is an illustration of which of Newton's Laws of Motion?

ANSWER: THIRD

TOSS-UP

17) CHEMISTRY *Multiple Choice* What is the process that best describes the transfer of electrons from one atom to another through electrostatic attraction?

- W) Ionic bonding
- X) Repulsion
- Y) Nuclear force
- Z) Covalent bonding

ANSWER: W) IONIC BONDING

BONUS

17) CHEMISTRY *Short Answer* The force between two electrically charged objects can be changed by altering what two quantities?

ANSWER: THE AMOUNT OF CHARGE AND THE DISTANCE BETWEEN THE OBJECTS

TOSS-UP

18) MATH *Short Answer* If $8x^3 - 4y = -16x$, express y as a function of x in simplest form.

ANSWER: $y = 2x^3 + 4x$

BONUS

18) MATH *Multiple Choice* Solve the quadratic equation $3x^2 + 2x - 8 = 0$.

- W) $x = 2$ or -4
- X) $x = 8$ or -12
- Y) $x = -2$ or $4/3$
- Z) $x = 8$ or $-4/3$

ANSWER: Y) $x = -2$ OR $4/3$

TOSS-UP

19) ENERGY *Short Answer* What kind of potential energy is stored in the reservoir behind a dam?

ANSWER: GRAVITATIONAL

BONUS

19) ENERGY *Multiple Choice* Which of the following is NOT a significant limitation to the further development of U.S. hydropower?

- W) Availability of sites for new large hydro facilities
- X) Regulatory requirements
- Y) Maintenance costs
- Z) Environmental concerns

ANSWER: Y) MAINTENANCE COSTS

TOSS-UP

20) EARTH AND SPACE *Short Answer* In what year did astronauts first land on the Moon?

ANSWER: 1969

BONUS

20) EARTH AND SPACE *Multiple Choice* NASA's Lunar Reconnaissance Orbiter, which reached lunar orbit in June of 2009, has gathered digital information about the moon. Which of the following has NOT been observed by LRO?

- W) The far side of the moon is rougher and has more craters than the near side
- X) Cliffs in the lunar crust indicate that the moon has expanded in the recent past
- Y) Astronaut landing sites
- Z) Lunar rilles, which look like river channels

ANSWER: X) CLIFFS IN THE LUNAR CRUST INDICATE THAT THE MOON HAS EXPANDED IN THE RECENT PAST

TOSS-UP

21) PHYSICS *Short Answer* Providing your answer to the nearest degree, what is absolute zero in degrees Celsius?

ANSWER: -273 DEGREES CELSIUS (ACCEPT: 273 DEGREES CELSIUS BELOW ZERO)

BONUS

21) PHYSICS *Short Answer* When air in a closed system is heated, what does it do?

ANSWER: EXPANDS (ACCEPT: RISES)

TOSS-UP

22) ENERGY *Multiple Choice* Which of the following devices stores electrical energy in chemical form in order to release it slowly through a circuit?

- W) Inductor
- X) Resistor
- Y) Capacitor
- Z) Battery

ANSWER: Z) BATTERY

BONUS

22) ENERGY *Multiple Choice* Which of the following types of battery is most commonly used in automobiles?

- W) Lithium-ion (read as: LI-thee-uhm)
- X) Nickel Cadmium
- Y) Lead-acid
- Z) Zinc chloride

ANSWER: Y) LEAD-ACID

TOSS-UP

23) MATH *Short Answer* Determine the slope of the line that has the equation:
 $y - 14 = 7(x + 2) - 5$.

ANSWER: 7

BONUS

23) MATH *Multiple Choice* Line 1 and line 2 are parallel. If line 1 contains the points (6, 13) and (4, 11) and line 2 contains the point (8, 20), determine which of the following points lies on line 2.

- W) (12, 15)
- X) (18, 10)
- Y) (10, -12)
- Z) (14, 26)

ANSWER: Z) (14, 26)

TOSS-UP

24) ENERGY *Multiple Choice* Which of the following is a renewable resource?

- W) Diamonds
- X) Wood
- Y) Coal
- Z) Propane

ANSWER: X) WOOD

BONUS

24) ENERGY *Multiple Choice* Which of the following choices describes one reason why the greenhouse effect is important?

- W) It warms the Earth to a temperature necessary for life on Earth
- X) It allows solar radiation to escape, preventing extreme radiation
- Y) It cools the Earth to a temperature necessary for life on Earth
- Z) It creates nitrogen for Earth's atmosphere

ANSWER: W) IT WARMS THE EARTH TO A TEMPERATURE NECESSARY FOR LIFE ON EARTH

TOSS-UP

25) EARTH AND SPACE *Multiple Choice* Why is the Kepler telescope unique?

- W) It is pointed at one specific target
- X) It is focused on a large section of the sky
- Y) It is scanning the entire sky
- Z) It generates a small amount of data

ANSWER: X) IT IS FOCUSED ON A LARGE SECTION OF THE SKY

BONUS

25) EARTH AND SPACE *Short Answer* What are scientists hoping to discover with the Kepler telescope?

ANSWER: PLANETS LIKE THE EARTH